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Animal Keepers' Forum



May 2016, Volume 43, No. 5



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125 ABOUT THE COVER

126 FROM THE PRESIDENT

128 COMING EVENTS

FEATURED ARTICLES

130-135

Breeding Spangled Cotingas:

A colorful conundrum

Heather Neldner

136-139

A Novel Approach to Customizing Enrichment for Individual Animals Using Behavioral Networks

Samantha Lauby and Susan Lewis, Ph.D.

ENRICHMENT OPTIONS

140-142

Branching Enrichment: Connecting people and enrichment with an enrichment tree

CONSERVATION STATION

144-145

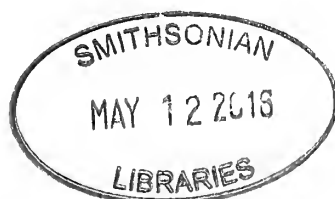
International Rhino Foundation:

Harry's Incredible Adventure

TRAINING TALES

146-149

Imprint Inspired: Red Kangaroo Training Program at Franklin Park Zoo



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The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

About the Cover

This month's cover photo was taken by Sarah Kirkman of Akron Zoo and features a male bald eagle in his exhibit that opened in July 2013 as part of Grizzly Ridge, Akron Zoo's most recent expansion. Petry is one of six rehabilitated, non-releasable bald eagles at the Akron Zoo. Bald eagles (*Haliaeetus leucocephalus*) reach sexual maturity around five years of age, at which point they have adult plumage including a white head.

Petry was rescued as an orphaned chick approximately five years ago in northern Michigan. He was found trapped in an uprooted tree after a stormy weekend and required medical attention. He was named "Petry" after an Army Ranger who received a Congressional Medal of Honor for receiving a similar injury while on duty.

Petry is often perched near the window of the bald eagle exhibit and is a favorite among the staff and guests. Despite his mid-level amputation on his right wing and a healed fracture in his left wing, he gets around the exhibit well. Petry is a very curious eagle and interacts with the keepers and enrichment often. He also participates in training sessions which include behaviors such as target, station, and scale. Keepers are currently working on tactile behaviors with the goal to do voluntary physical exams with Petry.

Articles sent to *Animal Keepers' Forum* will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for **AKF**. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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We all volunteer. Volunteering enables us to give back to our community, our profession and even ourselves. There are many volunteers involved in the operation of the American Association of Zoo Keepers (AAZK). You may volunteer doing fundraisers or conservation activities with your local Chapter. I am grateful I have had the opportunity to volunteer with my Chapter, but also on the Committee level and the Board level of the Association.

I am pleased to announce the addition of another volunteer position to the AAZK Board of Directors to continue moving our Association forward to meet Member's needs. Filling the position is Rachael Ruffino from the Smithsonian's National Zoo. Rachael received the next highest number of member votes in the last election and so has been appointed to the Board. Rachael's oversight will be the Communication Committee. Bethany Bingham becomes oversight of the Professional Development Committee and continues as Conference Manager. Bob Cisneros will continue developing AAZK Online. Together we will continue to advance AAZK and the zoo and aquarium profession.

Hosting a conference requires many volunteers working hard and putting in many volunteer hours. Our Association is very fortunate to have strong and dedicated Chapters stepping up to host excellent conferences each year!

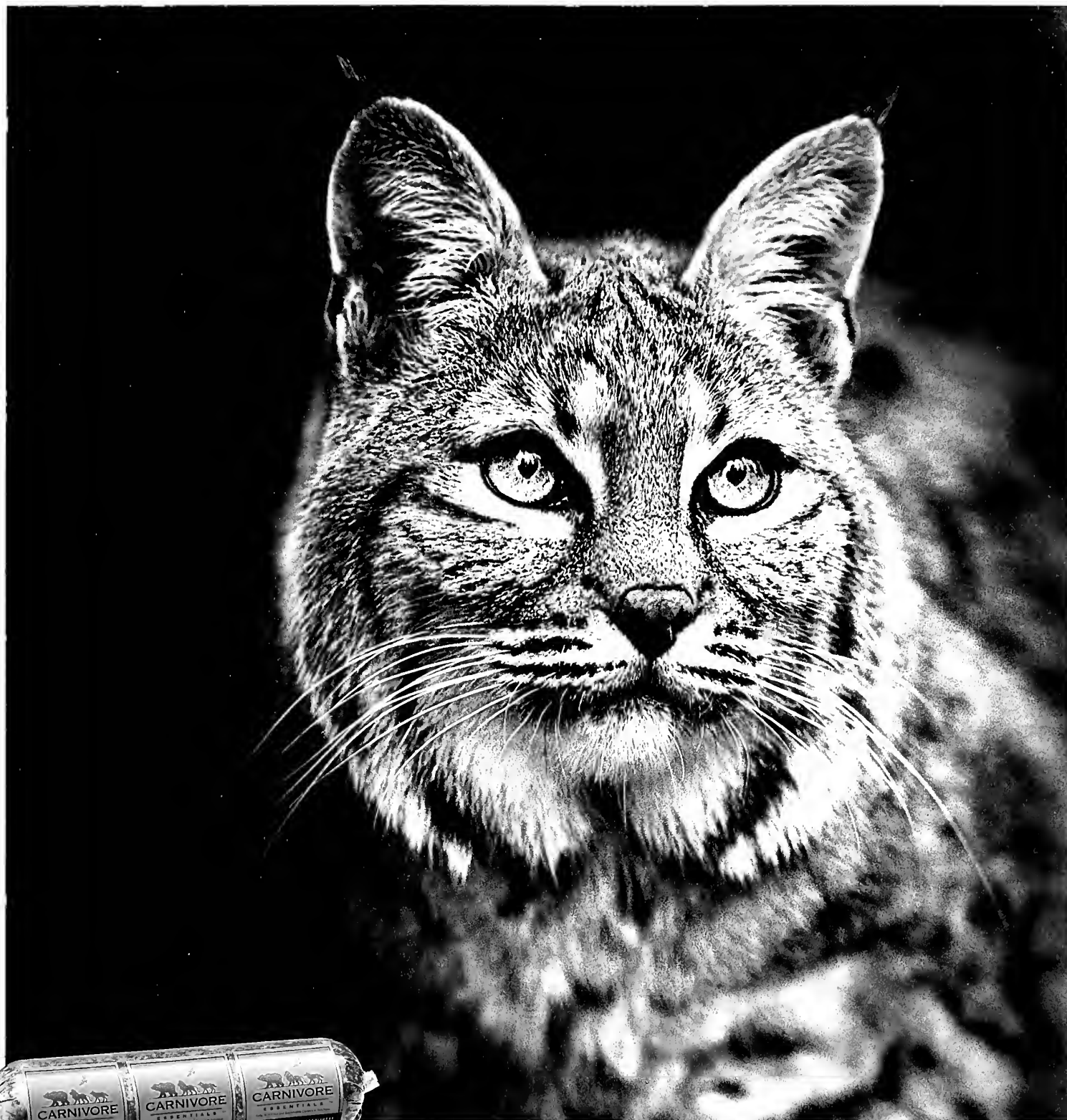
The Memphis Chapter is hosting this year, September 19-23, and it promises to be an exciting experience! Memphis is known for its food, music and Elvis Presley's Graceland Mansion...thank you very much! Southern hospitality will top off the conference. You can visit <http://www.memphiszoo.org/aazk-conference> for information on the conference and events.

Don't forget to register and book your hotel room today! Whether you are interested in one of three certification track workshops (Avian or Carnivore husbandry and Animal Welfare), paper sessions or topical workshops from "Crisis Management in Zoos and Aquariums" to "Maximizing Animal Conservation Efforts as a Keeper." The Memphis Chapter members will be maximizing their volunteering and making the conference a great experience for You. Your volunteer AAZK Board and many committee members will also be there. Please look for us there. We would like to get to know you and answer any questions you might have.

I hope you will look for future opportunities to volunteer your time and abilities in your Chapter or on a National Committee.

A handwritten signature in cursive script that reads "Penny Jolly".

Penny Jolly
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on Bear Research &
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Anchorage, AK
International Association
for Bear Research and
Management
For more information go to:
www.iba2016.com

June 22-25, 2016
**International Herpetological
Symposium**
St. Louis, MO
Hosted by Saint Louis Zoo
For more information go to the
International Herpetological
Symposium website.

August 1-4, 2016
**14th Annual Symposium on
the Conservation and Biology
of Tortoises and Freshwater
Turtles**
New Orleans, LA
For more information go to:
[http://www.turtlesurvival.org/
conference#.Vwq-iPkrLIU](http://www.turtlesurvival.org/conference#.Vwq-iPkrLIU)

August 16-19, 2016
**2016 Orangutan SSP
Husbandry Workshop and
Course**
Madison, WI
Hosted by Henry Vilas Zoo
For more information go to:
[http://www.orangutanssp.
org/2016-workshop.html](http://www.orangutanssp.org/2016-workshop.html)

August 18-20, 2016
Chimpanzees in Context
Chicago, IL
Hosted by Lincoln Park Zoo
For more information go to:
www.chimpsymposium.org
Will precede the joint International
Primatological Society congress and
American Society of Primatologists
meeting also at Lincoln Park Zoo.

September 7-11, 2016
AZA National Conference
San Diego, CA
Hosted by San Diego Zoo
Global and SeaWorld
San Diego
For more information go to:
[www.aza.org/
annualconference](http://www.aza.org/annualconference)

September 25-30, 2016
**International Aquarium
Congress**
Vancouver, BC
Hosted by The Vancouver
Aquarium Marine
Science Centre
For more information go to:
<http://iac2016.venuewest.com>

October 1-5, 2016
Otter Keeper Workshop
Buffalo, NY
Hosted by the Buffalo Zoo
For more information go to:
www.otterkeeperworkshop.org

October 31 - Nov. 5, 2016
**2016 International Gorilla
Workshop**
Guadalajara, Mexico
Hosted by the Guadalajara Zoo
For more information go to:
<https://igw2016.wordpress.com>

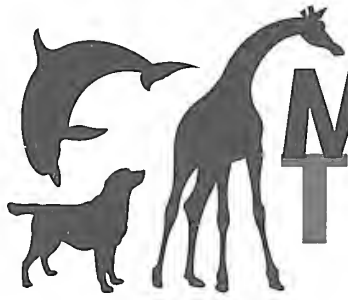


September 19-23, 2016
AAZK National Conference
Memphis, TN

*Hosted by Memphis Zoo AAZK
Chapter and Memphis Zoo.*

MemphisZoo.org/AAZK-Conference

November 14-18, 2016
**15th International Elephant
& Rhino Conservation and
Research Symposium**
Singapore Zoo.
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Breeding Spangled Cotingas: A colorful conundrum

Heather Neldner
Zoo Keeper
Milwaukee County Zoo, Milwaukee, WI

This paper covers my personal experience and observations while trying to breed spangled cotingas (*Cotinga cayana*) at the Milwaukee County Zoo. It is written from my perspective and when I use "we", I am referring to aviary staff. All other observations are mine, unless otherwise noted. I have been fortunate enough to work with spangled cotingas for almost 10 years and have spent the last five years trying to breed them off exhibit. I find them to be wonderfully fascinating little birds and I feel lucky to work with them every day. I have learned a lot about their body language and breeding behavior in the last few years and would like to share my observations with everyone in hopes this information will help them breed better in captivity.

Spangled cotingas are robin-sized birds from South America. Males are vibrant blue with contrasting black wing and tail feathers, with small black feathers interspersed throughout their plumage. They have a magenta throat patch which they use when displaying to the females. Female cotingas are dark brown with lighter brown feathers interspersed throughout their plumage, sometimes with a hint of blue. The female's drabber colors help them camouflage while nesting and they are quite pretty in their own right.

Spangled Cotingas are rare in captivity. According to ZIMS there is one institution in Asia holding three birds, five institutions in Europe holding nine birds, and eight institutions in North America holding 43 individuals. The captive population seems to have more males than females.

Cotingas as a group are very diverse. Some species live in pairs, some are polyamorous and one species lives in highly social groups. Not much is known about courtship or relationships between the sexes, except the female alone attends the nest. Nests are very small and may have evolved under selective pressure of nest predators. Nests are rarely found in the wild due to the size, camouflage and the parent bird's behavior which is adapted to draw as little attention as possible to the nest. Chicks are thickly covered with down. From nest observations, it appears the female broods the nestling very little after the first few days. Other observations of cotingas show blue cotingas habitually perch on dead tree tops, sometimes for long periods of time. They fly strongly with undulating flight and males advertise themselves with flights between treetops and make wing noise. When feeding, they often perch in trees and then make short flights to pluck one fruit at a time. They often feed socially in small groups (Snow, 1982).

Milwaukee County Zoo had early success breeding spangled cotingas in April 2001 and was the first zoo in the Western Hemisphere to do so. The early success was with a young wild caught pair obtained from Penguin International. This pair of birds successfully produced several offspring until the female passed away due to old age. The male was later sent to another zoo for breeding. The female cotinga I worked with was named "Mina" and is the daughter of this pair of birds. The early breeding success was before I started working at the aviary.

When I initially started working with the cotingas we had "Mina" paired with a young hand-raised imprinted male cotinga named "Skyler" who came to us from the San Diego Wild Animal Park. The birds were housed in an off exhibit breeding/holding area. They never produced any chicks together and got along well but we never saw any courting behavior between them. They kind of ignored each other.

When our older female cotinga passed away we decided to do mate choice with "Mina" and the two males we had available; "Skyler" and another male "Kyle" who is wild-hatched. We placed Mina on exhibit which is large and well-planted with open space for displaying, but lush towards the back and sides of the exhibit. It has a small pool for bathing and misters incorporated to mimic rain. The front of the exhibit is piano wire. There are two howdy cages in the upper portion of the exhibit which are able to be opened to the exhibit or closed to the exhibit via a guillotine door. The howdies themselves are off exhibit in our breeding/holding area. Birds can only access the howdies if the guillotine door is open. The howdy cages are 48" wide by 32" high by 26.5" deep. We placed each of the males in howdy cages next to each other with branches attached to the outside to see who she would sit next to. It became obvious fairly quickly who she liked better. She would repeatedly choose to sit next to Kyle. They were introduced to each other on exhibit and Skyler was moved out of the area. Initially the birds got along well. The howdies were repped for nesting and shower curtains were hung to give them privacy from keepers working in the area. Fresh fruits were added to their diet and we increased the frequency of canopy mistings to mimic monsoon weather which happens prior to nesting in the wild. She laid several eggs but they never hatched.

In 2007, they started to not get along. Mina would viciously attack Kyle and they would end up tumbling to the ground in an angry heap of birds. In her rage, she would pluck out his feathers. During one of her attacks, Kyle sustained a severe injury to his keel which required surgery to repair it. He was off exhibit for quite some time while recovering. Once he was recovered, he was placed in the howdy and they were monitored closely until we felt they could get along again and be reintroduced. They got along for a while but in 2009, she reinjured his keel and he was pulled off exhibit again to recover.

Our next step was to put him out on exhibit, pull her out to a howdy and see how they got along. Once positive behaviors were seen between them, they could be introduced again. The intro did not go well. The birds were pulled off exhibit and placed side by side in holding. They stayed this way for several months before we tried reintroducing them off exhibit. Again, it did not go well and the birds were placed in side by side holding. We continued to try introducing them once we saw positive behaviors between them (sitting close to the mesh on both sides of the divider, etc.). We tried putting the male in with her, and vice versa. Nothing was really working; they would get along for a short while, then Mina would get aggressive. I have never witnessed any aggression from the male towards the female; the female was always the aggressor.



Cotinga chick 7 days old



Cotinga chick 17 days old (after being moved-mom died)



Cotinga chick 17 days old



Cotinga chick 25 days old

I did some research about breeding in the wild and it is my understanding they are a lekking species; males come and display for the females. Females choose a mate, they mate, and then go off to raise young on their own. I wanted to replicate this pattern in captivity, even though the space and time made this more difficult. I also recalled talking to someone from the Brookfield Zoo in Illinois about breeding birds of paradise and they were having a similar problem until they built a chute for the female to use to choose where she wanted to nest. Enter "the tunnel of love".

Before I introduce the "tunnel of love", I'd like to share my personal observations on cotinga body language and behavior. Cotingas are quite secretive birds and don't like being closely watched. It took me several years for them to get comfortable with me observing them before I was able to see any of their breeding behavior.

Cotingas have very few vocal expressions. I distinguished two vocalizations. Males make a cooing sound when courting females; it kind of sounds like a door hinge that needs a little bit of oil on it. They also make a sad little whining sound when caught or injured. Other than that they are fairly quiet little birds.

I have learned while watching them they are extremely expressive with body language and how they hold their feathers. A happy, content cotinga looks like a little fluffy ball, they will sit with their feathers slightly fluffed out, no real neck showing, all head feathers will be puffed up and slightly spiky looking. They have a nice relaxed look about them. An excited cotinga will have very spiky looking head feathers and their body feathers will be slightly slicker. Excited cotingas bob their heads a lot. Nervous cotingas will have all their body feathers slick, the feathers on their forehead, extending down the back of their head and neck will be slick, their cheek feathers may be slightly puffed out but their eyes will be very large and look like they are bulging out.

I have seen the male cotinga do an appeasement behavior towards the female if he is unsure of her mood. His look resembles a nervous cotinga, but instead of having slick body feathers he will puff out his stomach feathers slightly, drop his wings slightly and hold them slightly away from his body. He will freeze this way for several seconds then move slowly to judge how she is going to react. If she doesn't fly at him, he will slowly relax and return to a normal state. Scared cotingas are very slick, very tall and don't move much. Their eyes bulge out when scared. The female cotinga Mina will display her displeasure towards the male or other birds (she especially does not like bulbuls) by angrily preening her stomach feathers. When she is not vigorously preening and/or pulling feathers out, she will bob her head very rapidly and will sometimes fly rapidly between perches.

Courting display is very interesting. The male will coo at the female, then perch on a high perch, preferably one in the sun to show off his feathers. He will lean to one side, drop his wings a bit, tip his head back towards his shoulder, fluff out his throat patch, slowly rock back and forth, then switch sides and repeats the behaviors. Sometimes he will do this a third time, then he will coo again and do a rapid looping flight towards and around the female, landing on a perch near her. He will then do the throat display again. His wings make a whirring sound when he loops past her. Often he will do another display flight unless she starts chasing him. Then he stops all together and will do an appeasement display. Unless she's in a really unreceptive mood, she usually leaves him alone once he does his appeasement display. If she is in a tolerant mood or receptive towards him they will usually perch about a foot apart. Often they will move to a more secluded spot. I have not observed any mating behavior. Beginning in 2013, I have seen more display flights than previously. Sometimes they would display right in front of me. I have never heard the female respond to the male's cooing. If she wants to

be with him she will move near him when he coos at her. I do not know if females normally respond vocally or not as I have not witnessed it.

Diet

The cotingas receive a soft billed diet consisting of apple paradise pellets, ground eggs with shell, fruit and veggies cut to the appropriate size, seasonal fruits, and a small amount of insects including mealworms, wax worms and crickets. Calcium is added during the breeding season. We have also added a supplement called Sunshine Factor™ since 2008. The supplement is made by AVIx and is a red palm oil supplement. The supplement is rich in carotenoids, vitamin E, CoQ10 and has a good balance of fatty acids. Benefits of the supplement include improved plumage, improved energy levels, helps the eyes, skin, heart and immune system. AVIx is made by a company called HEALx and can be purchased online at many bird specialty stores. We started using this product because our supervisor at the time believed the birds were missing some “essence of the wild”. We offer a small amount daily in a wax worm. The birds eagerly eat this supplement.

Seasonal fruits offered include: blueberries, kiwi, apricots, papaya, mango, fig, plum, pear, peaches, strawberry, black berries, raspberries, cherries.

Mina seems to prefer papaya, mango, blueberries, cherries, and kiwi but I saw her consuming all types of fruit. Orange and dark colored fruits are usually eaten first. They are not big insect eaters but they do enjoy the occasional wax worm.

Our current set up

The cotingas are set up for breeding in an off exhibit holding area above the public exhibit areas. This area has sky lights and can be quite warm with temperatures ranging anywhere from 68-103. Average temperatures during the summer are mid 90's. We have fans set up for extra ventilation. They are housed in side by side cages about eight feet wide by 12 feet deep by 10 feet high. There is tennis netting on the sides to help shade the cages and provide visual barriers to the birds nearby. The female's cage also has a shower curtain on one side of her cage to provide extra visual barrier on her side. The cages have lots of silk plants along the top and sides of the cage. The middle of both cages has branching and open space for displaying. The female's cage has a tennis netting screen hanging in one section by one of the nests for extra privacy. Perching is natural branches and grapevine. Each cage has a poultry mister for bathing and there is a live palm plant in the female's cage. There are three open cup nests placed in the female's cage toward the back of the cage, located towards the top which are flanked by silk plants.

The “tunnel of love”

In 2011, I constructed a chute between cages which I refer to as the “tunnel of love”. It is made out of hardware cloth, has two doors - one on each end, the bottom is covered with tennis netting so they can easily walk through it and there is perching attached to the ends of the chute. When the doors are closed, the birds can still perch on the porch area of the chute. We also built an escape hatch on the bottom of the cage for the male if he gets chased.

Initially I trained the male to go through the chute into the female's cage and back to his cage. Before allowing the birds to be together, I opened the male's side and kept the female's side closed. I placed wax worms or blueberries on the porch or slightly inside the chute to get the male comfortable going into the chute. Using the chute, he could visit the female that way without going directly into her cage. I conditioned him this way for several weeks. I used the cue “shift” when I was conditioning him to go in and out of the chute. The male was very eager to go into and out of the chute. I waited until the birds were showing behaviors



Eight months old. Stayed at this stage for quite a while before the blue really started coming in.



Three months old.

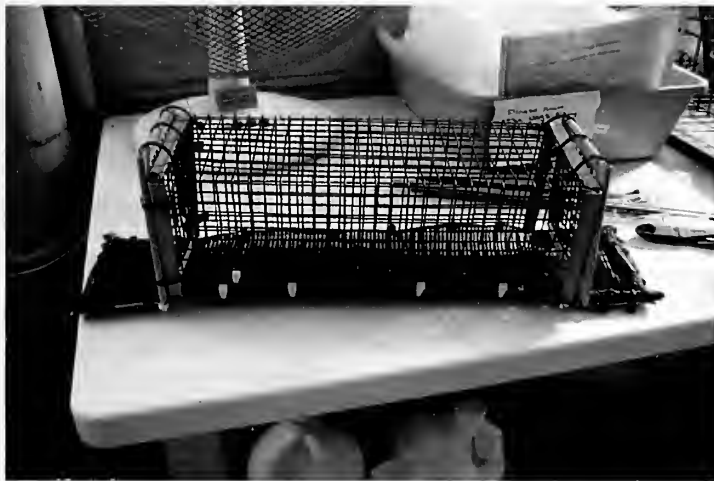
indicating they wanted to be together before opening up the chute on both ends. When they wanted to be together, they sat side by side a lot and the male vocalized and started displaying towards the female. Breeding season for cotingas is March through November. Our male usually starts calling and/or displaying in late February.

The first introduction only lasted four days before she attacked and injured the male. They were separated for a while so the male could heal. It was decided at this point once they could be reintroduced to one another, they could be together during the day but separated at night so I could keep an eye on them. They also remained separated on my days off.

They had several more introductions during 2011 and she laid several eggs which failed to hatch. We believe the eggs were infertile because



3 months old, note the white tipped feathers coming in on back and wings



Tunnel of love before being installed in cages

they were breaking down by the time we pulled them. The male was kept separate from the female when she had eggs.

In March 2012, I re-propped both cages, adding additional silk plants and started conditioning the female to go into the chute instead of the male. Both birds were introduced two weeks later and allowed to be together during the day and separated at night. The female eventually started going back into her own cage before I asked her to in the afternoons. I learned fairly quickly she gets very difficult to shift prior to laying eggs and starts carrying around leaves two to three days before laying eggs.

She laid four eggs between April and August-all proved infertile. In September we decided to allow 24 hour access as long as no aggression was seen between them. They were still separated on my days off and

allowed access when I was working. This continued until November when the birds did not spend any time together and breeding season was deemed over. Both sides of the chute were closed until next breeding season. 2012 was considered successful because she incubated all her eggs well and no aggression was seen between either bird.

The 2013 nesting season started well. The birds were seen courting in February, were allowed all day access and separated at night. The first egg was laid in April and the female was aggressive towards the male prior to the egg being laid. A total of five eggs were laid in 2013 and all were infertile. However, the female started building better nests and was much better at incubating this year. In addition, the male's display flights became more elaborate. When the female displayed aggression towards the male, I was better able to spot it early and give them a break for a few days before continuing introductions. Nothing escalated past mild aggression and aggression was usually seen just prior to egg laying.

2014 a successful year!

The female cotinga was now 12-years-old, the male 10-years-old and they started displaying in February. Instead of shifting birds into and out of each other's cages, I was opening the chute so they can decide to be together or not. This seemed to be better for both of them. Usually the female chose to go into the male's cage. I started allowing them day access and separated them at night. The female usually returned to her cage on her own when she's had enough visitation. This made it easy to separate them when I had to. If they were still together in the afternoon and needed to be separated, I placed a wax worm on the female's side and asked her to shift. She usually shifted back to her cage within a minute or two and rarely gave me trouble going back into her cage. The male wasn't as good about shifting; it usually took a while for him to decide to go into his own cage for a treat. They laid their first egg in April and it was infertile. Since they were getting along well, it was decided to allow them 24 hour access (separated on my days off). They had a second egg in May and it was also infertile.

A third egg was laid on June 13. Prior to the egg being laid the female was observed carrying lots of nesting material around. She preferred silk plant leaves to any other nesting material. I offered her a bowl filled with silk plant leaves for nesting material and she used those leaves instead of pulling leaves off plants. This nest was different from all other nests she previously built. The nest was thickly lined with leaves and all the longer leaves were pointed upwards, lining the cup.

On July 3, I candled the egg. It was fertile. The chick was in the air cell and the egg was immediately placed back into the nest. On July 4, I checked the nest using a mirror on a long pole. There was a very large chick in the nest! This is our first successful hatching in 12 years and the incubation period was 21 days.

The chick was covered in a thick, white down. To offer the female the best chance of raising the chick we kept nest checks to a minimum and all disturbances to this area low. I learned when she was nesting she got very nervous if we changed her routine too much so we maintained the same routine for feeding and cleaning. On day 11, I noted the chick's eyes were open and small pin feathers were emerging on its wings.

Every morning we offered her a fresh dish of food with extra fruit and bugs on it. In addition, she had a small cup in her cage with mealworms in it. She seemed to be feeding the chick a lot of fruit and insects. I turned on her mister every day to keep her cage cool. The cleaning schedule continued as normal but we didn't spend a lot of time in there scrubbing. Instead, we were doing a thorough rinse because she seemed unhappy if we spent too much time in the area. In the afternoon, she received a fresh dish of food and the bugs are topped off if needed. The mister was turned off in the evening.

Chick hand rearing highlights

Days 17-32:

The chick was fed six times a day; five times during the day and once on the night shift around 6:30 pm. Temperature in the rearing cage was set between 80-85 degrees F with a heat lamp. On day 18 the chick was seen flapping in the nest and doing a lot of preening of the newly emerging pin feathers. Chick was very vocal and on day 21 was seen branching. On day 24 we saw the first casts. Cotingas regularly cast undigestible fruit skins, lettuce and carrots. The chick had fecal sacs until it fledged. On day 29, the first small flights were seen. On day 30, the chick started drinking water out of a cup we held up to it after feeding. On day 31, we added a food cup and started feeding the chick "from below" near its chin to get it to look down for food. On day 32 the chick flew to the food cup area at feeding time, started the "cotinga head bob" and became difficult to feed. The chick was whining, tossing food and refusing to eat.

Days 33-37:

We reduced feedings to five times a day; four times on day shift and once on the night shift. Fruit was no longer skinned as the chick was able to handle fruit with skin and was casting regularly. On day 34, the chick was eating food on its own between feedings, ate out of a dish if held up to it, would fly to the "food site" when hungry at feeding times, and readily drank out of water dish when held up to it.

Days 38-39:

Feedings reduced to four times; three times on day shift and once on the night shift. The chick was eating well on its own between feedings, could fly well and tail feathers were lengthening.



She seemed to be doing nest cleaning because the nest was spotless every time I checked it. Fecal sacs and soiled leaves were removed. At around 10 days old, I found a pile of soiled leaves behind the pot her plant was in. It looked to me like she was removing any evidence of her chick as far away from the nest as she could get it.

She always came off the nest while we were in the area feeding and cleaning. I was unable to determine how much she brooded the chick. I often saw her sitting away from the nest, or on a branch about a foot away from the nest. Since the chick was very thickly covered in down, it may not have needed to be consistently brooded. She would not feed the chick while I was in the area.

On day 17, the female cotinga suddenly died while I was servicing the cage. She flew to her "normal" spot where she waited while I put in fresh food and water. Seconds later she fell off the perch, screamed and died. Necropsy results showed she died of heart failure, possibly due to old age. This was very upsetting to all of us. The chick was moved to a smaller cage where we could easily care for it now that it needed to be hand raised.

The chick was initially quite scared of us. It had never seen people up to this point but recognized food held on a pair of long forceps and started eating pretty readily. In particular, it liked any dark red items. Cherries

Day 40:

Feedings reduced to three times a day; two times on day shift and once on the night shift.

Days 41-54:

Chick continued eating on its own between feedings. On day 46 it was flying very well and the wing and tail feathers were almost adult length. On day 48, we began weighing every other day on T-perch in cage. Food platform was installed in cage and larger food and water dishes offered. On day 51, the chick started refusing food from night keepers and on day 53, we offered the last night keeper feeding. On day 54, we reduced to two feedings per day because the chick was only taking two or three bites from keeper at the beginning of the feeding session and was eating food mostly on its own.

Day 57:

Chick was eating completely on its own

Day 63:

Chick moved to the large cage next to its dad. The chick was very excited to see other birds and was very vocal. Chick seemed to enjoy being able to fly around more and spent a great deal of time exploring once it felt comfortable enough to do so. Chick no longer needed to be weighed; it had been maintaining a weight of 57g or so for the last two weeks. Also no longer weighing food as the chick was eating very well on its own and on a normal daily cotinga diet.

Day 74:

White feathers starting to appear on the chick's head and back.

Day 103:

Very small bright blue feathers appeared on the chick's face near the beak. The feathers were vibrant blue like the adult male and the chick was sexed as male at this time.

Day 173:

Vibrant magenta feathers started to appear on throat. Chick was named "Fig".

11 months old:

Chick began to molt into adult plumage. Body feathers started first, followed by wing and tail feathers.

13 months old:

Chick still had a few brown feathers on stomach but otherwise had full adult coloration.

14 months old:

Observed the chick attempting to do some of the breeding displays; fluffing throat feathers, doing the "leaning" behavior and attempting a looping flight. I am unsure of what age these birds obtain sexual maturity but it appears that he was attempting some adult courting behavior.

and plums, mango, apricot, papaya and kiwi were readily taken, along with our soft billed pellets (apple paradise) which are also red in color. On day 17, in the afternoon it was noted the chick seemed to be breathing very heavily. The vet staff was called and examined the chick. The chick had a small amount of "clicking" sound in one of its lungs and was started on antibiotics and fluids for five days. Fortunately the condition cleared up and the chick continued to do well for us.

Initially the chick was fed six times a day. Hand-rearing food was the same diet it was getting from mom. 50% apple paradise/soft billed mix, 50% fruit, two molted meal worms or two cut in half wax worms. Food items were dipped in water before offering to the chick until it was drinking water on its own. Calcium was added to the diet and fruit was skinless until the chick started casting on its own. The chick was allowed to eat as much as it wanted. Food items were weighed before and after feeding to determine how much it was eating.

He has been housed next to his father since the female passed away and he was often observed watching the male's behaviors and mimicking them to the best of his abilities. He is not overly friendly towards his keepers, other than being very excited about new toys being placed in his cage. He loves toys and always interacts with them shortly after they are given to him. Overall, I feel he is a well-adjusted bird and I have much hope he can reproduce in the future.

I would love to pair "Fig" up with a female in the future to see if a second generation captive-bred cotinga can produce offspring on its own. It is my sincerest hope my notes and observations can be useful to others who are attempting to breed this species.

Thank you to everyone who has helped me over the years with this project. A very special thank you to the "chick hand rearing team". Without all your help raising the chick, he would not have made it.

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AVIx supplements are made by a company called HEALx which is sold by Harrison's Bird foods, 7108 Crossroads Blvd. Suite 325 Brentwood, TN 37027
<http://store.harrisonsbirdfoods.com> 

A Novel Approach to Customizing Enrichment for Individual Animals Using Behavioral Networks

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Abstract

Animal personality is increasingly being recognized as having an important influence on the way animals respond to various stimuli, including enrichment. Here, we suggest a new way of identifying effective enrichment strategies for individual zoo animals that takes personality into account. This method uses behavioral networks to visualize how several behaviors affect one another and provide a tool to identify points of intervention. A case study to illustrate the approach is presented with two ring-tailed lemurs (*Lemur catta*) studied at the Milwaukee County Zoo. The network approach shows strong promise as a means to individualize enrichment, as well as to assess changes in behavior over time. Further studies could expand on the concept by using different species or varied methods to demonstrate efficacy more robustly.

Introduction

There has been an increase in interest in how individual animals react to different stimuli. These individual differences in behavior, also referred to as “animal personality,” are important to consider when looking at methods to assess behavior and welfare in captivity (reviewed by Dall et al., 2004). Assessing behavior is important to preserve the animal’s physical and mental well-being. Poor welfare can lead to reduced reproductive success and abnormal behaviors (reviewed by Broom, 1991). A common response to combat poor welfare is to implement environmental enrichment.

Environmental enrichments include changes to an animal’s captive environment that

promote species-specific behaviors. They are primarily used to tackle stereotypic behavior and improve an animal’s welfare (reviewed by Swaisgood and Shepherdson, 2005). However, the value of environmental enrichment is limited because it is not consistently tailored to individual differences in behavior. Studies of several species have shown that enrichment evokes varied reactions among members of the same species in zoos (e.g., Franks et al., 2013; Coelho et al., 2012; Izzo et al., 2011). However, few approaches allow animal managers to efficiently identify the most suitable enrichment for an individual animal. Network analysis is a visualization tool to investigate relations between people, animals, or concepts. The main parts of a network are the node, where the individual or concept is

represented as a shape, and the link, which is a line that represents some sort of relationship between nodes. Links are designed to identify both positively-reinforcing and negatively-reinforcing relationships. Networks are becoming increasingly popular to not just look at inter-individual interactions such as social networks, but intra-individual interactions with behaviors. For example, networks have been applied to better understand psychopathology symptoms and how they relate to one another within individuals (Bringmann et al., 2013). It is likely that an animal’s behaviors in a captive environment interact with one another in a network-like structure, with a focal behavior increasing in frequency with some behaviors and decreasing with others. If such behavioral networks exist, then there may

Table 1. Coded behaviors and their corresponding operational definitions.

Sleep/Inactive	S.A	Laying down or sitting with head down.
Sit-Alert	S.I	Bottom and front paws touching substrate; head up.
Climb	C	Locomotion on the tree trunk or branches; not pacing.
Groom	G	Scratching or licking oneself.
Locomotion	L	Walking on the ground; not pacing.
“Sunbathe”	S	Sitting with front paws not touching substrate.
Pace	P	Climbing or locomotion that goes in a fixed path twice within 10 seconds.
Other Interaction	OI	Affiliative or agonistic behavior towards the other individual; not mutual grooming.
Mutual Grooming	MG	Licking the other individual’s fur.
Interact with Enrichment	E	Touching, sniffing, or using the enrichment for its intended purposes.
Feed	F	Ingestion of food or water.
Other	O	Any other behavior not listed above.
Out of Sight	OoS	Animal not visible.

	Sitting-Alert	Climbing	Grooming	Locomotor	Sunbathe	Other Interaction	Interaction with Enrichment	Mutual Grooming	Feeding
Sleeping/Inactive	-0.126	-0.504	-0.689	-0.056	-0.079	0.081	-0.071	-0.595	-0.596
Sitting-Alert	X	0.419	-0.277	0.139	-0.017	0.146	0.073	-0.230	-0.541
Climbing		X	-0.134	-0.515	-0.515	-0.106	-0.306	0.396	0.118
Grooming			X	0.308	0.409	0.237	0.548	0.116	0.469
Locomotor				X	0.945	-0.284	0.348	-0.226	-0.277
Sunbathe					X	-0.255	0.372	-0.173	-0.191
Other Interaction						X	0.724	-0.503	-0.259
Interaction with Enrichment							X	-0.582	-0.378
Mutual Grooming								X	0.806
Feeding									X



be a visible point of intervention to decrease abnormal behavior and increase species-specific behaviors in a zoo setting. This may be an appropriate visualization tool to look at distinct personalities within a captive group of animals.

Here, we apply the network approach using two ring-tailed lemurs as a case study. The behaviors of ring-tailed lemurs are relatively well studied. They can exhibit a pacing stereotypy, which is indicative of poor welfare (Tarou et al., 2005). Considering that we are familiar with ring-tailed lemur behavior and there is potential to reform abnormal behavior, they are an appropriate model species. Our objective is to assess behavior in a particular animal, to find a point of intervention to create an effective enrichment for that individual, and to compare behavior with and without the intervention. We hypothesize that an enrichment designed for one individual animal will result in a positive change in behavior, while not influencing that of a second animal with a different suite of personality traits.

Methods

Two female ring-tailed lemurs at the Milwaukee County Zoo were the subjects. One lemur was recently introduced to the exhibit after the death of the other lemur's mate. Data collection took place on six Thursday and eight Sunday afternoons from September to November 2014 for eighteen total hours. An ethogram was created with *ad libitum* sampling to identify common behaviors (Table 1). Following construction of the ethogram, baseline behavioral data were collected using scan sampling in one-minute intervals for six

60-minute observation periods per animal. During baseline observations, a variety of familiar enrichment objects were present in the exhibit.

Following baseline observations, the a visual behavioral network was created in the program R. Networks are created based on correlations. Instances in which one behavior's frequency increases with another resulted in a positive correlation, and instances in which a behavior decreases in frequency with an increase in another resulted in a negative correlation. The output of R is a correlation table (Table 2) where the correlations between the frequencies of each behavior (on a per-hour basis) with all others in the first phase are summarized. The direction and magnitude of the numerical correlations are then translated into a visual representation of the behavioral network.

After a baseline was established, a specific, novel enrichment was selected based on criteria described below. This new enrichment was introduced to the animals for the next ten hour-long observation periods over five days. The enrichment was removed every observation day. Finally, the enrichment type changed for the last two observation periods to reestablish the baseline. All data were compiled as a line graph to compare animals' responses to enrichment conditions.

Results

Networks

There were striking differences between the two lemurs' behavior networks (Figure 1). Though some correlations were consistent (e.g., the positive correlation between interaction with

enrichment and grooming), many correlations differed in terms of both direction and strength. In particular, feeding in one lemur (Figure 1A) had a moderate negative correlation to sleeping/inactive and sitting-alert (which were excessive in both lemurs), while feeding for the other animal was more independent of other behaviors (Figure 1B). Because we did not observe clear evidence of stereotypic behavior in either animal, the target behavior we chose to reduce was sleeping/inactive. Due to differences in how feeding interacted with sleeping/inactive between lemurs, a feeding enrichment was identified as a good candidate for this purpose.

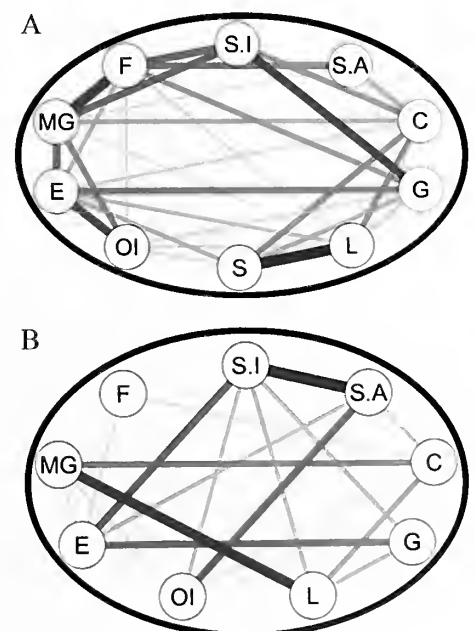


Fig. 2A • Interaction with Enrichment (Target)

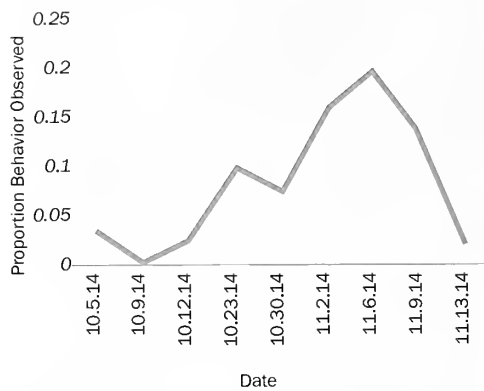


Fig. 2B • Sleeping/Inactive (Target)

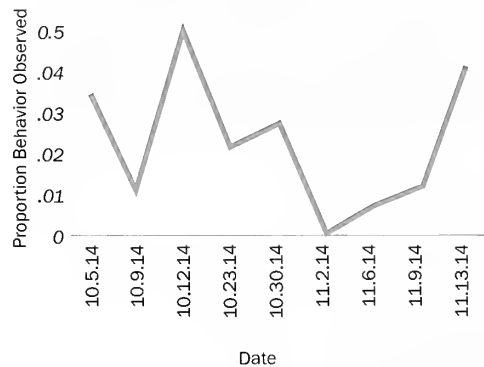


Fig. 2C • Locomotion (Target)

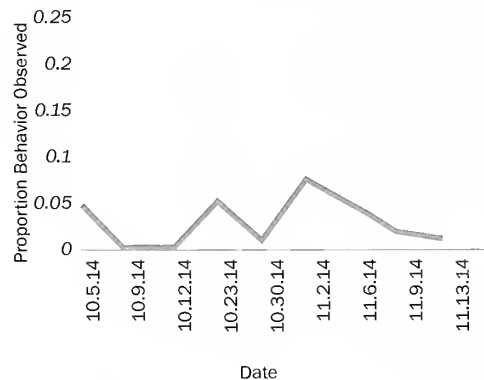
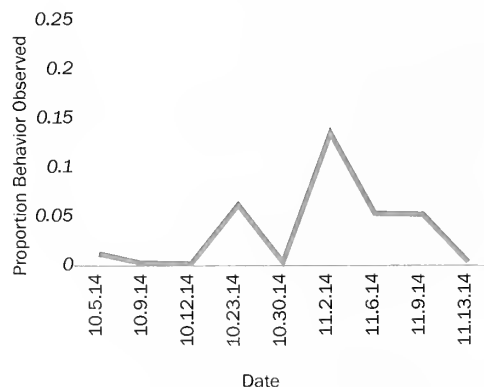


Fig. 2D • Sunbathe (Target)



Effects of Enrichment on Behavior

As predicted, more behaviors appeared to have changed in the enrichment phase for the target lemur compared to the non-target lemur. Specifically, for the target lemur, interaction with the enrichment increased (Fig. 2A), sleeping/inactivity decreased (Fig. 2B), locomotion increased (Fig. 2C), sunbathing increased (Figure 2D). Though a decrease in sleeping/inactive was expected, the increase in locomotion and sunbathing was not expected because feeding was not strongly correlated with these two behaviors. However, foraging enrichment is different than free-feeding because it involves manipulating an object to receive food. It is possible that the effects of enrichment in the baseline phase, which had moderate positive links to locomotion and sunbathing, were enhanced with the target lemur in the second phase. An increase in interaction with enrichment could indicate higher interest in the foraging enrichment and the food.

In contrast, the non-target lemur's behavior stayed relatively stable, except for a small increase in grooming (Fig. 3A). Interaction with the enrichment increased, but the effect was smaller than with the target Lemur (Fig. 3B).

Discussion

Overall, the network approach shows promise as a means for researchers or animal care managers to find a suitable enrichment item that matches an animal's personality. Here, the lemur with the strongest behavioral linkages between feeding and activity responded most strongly to a foraging-based enrichment. Food enrichment has been shown to be successful in reducing inactivity for ring-tailed lemurs (Dishman et al., 2009; Maloney et al., 2006).

A key strength of the network approach is that, with minimal training, it is a feasible means of determining animal personality. As such, it provides a quicker way of optimizing the effects of enrichment than trial and error alone. Though zoo keepers may not have the time to record an animal's behavior for hours, many zoos use volunteers to maintain behavior records of animals. Zoo keepers can then use these data to visualize the network and determine the appropriate enrichment.

While networks may be useful in developing new individualized enrichment or helping choose from existing enrichment, there are some possible weaknesses to consider. First, although the creation of the networks is based on quantitative data, the interpretation of these networks are highly subjective. This means that there may not be a consensus regarding what enrichment is optimal. The second potential weakness is that, depending on the behaviors observed, increasing or decreasing the target

Fig. 3A • Grooming (Non-Target)

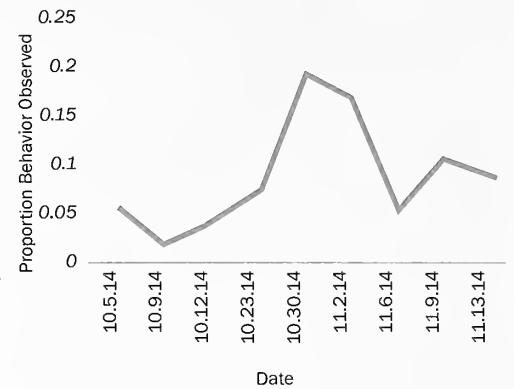
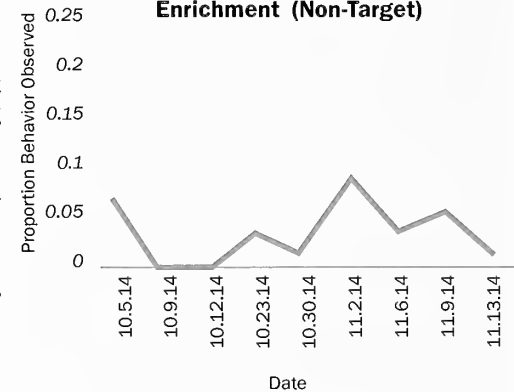


Fig. 3B • Interaction with Enrichment (Non-Target)



behavior may not be feasible or make sense. An example with the ring-tailed lemurs would be if increased grooming reduced stereotypic behavior. How zoo keepers can increase grooming may not be obvious given the enrichment items available.

There are also limitations to the case study that need to be addressed. One limitation is that this was a short-term pilot experiment intended to illustrate the potential of the network approach. Further studies will be needed to look into this approach for a longer term to see if the network stays consistent throughout time. Another limitation is that we did not create an enrichment for the non-target lemur and therefore cannot confirm that the target lemur's change in behavior did not result from chance fluctuations. A multiple baseline design, where target animals' enrichments start at different time periods, would be ideal for multiple animals living in the same exhibit.


The network approach may be useful in other contexts, such as assessing changes in behavior over time when an aversive event (such as illness) happens. The study only investigated one problem that a network may solve and one method for demonstrating efficacy of the technique. Future studies could

expand on the idea by using other species, different methods of demonstrating efficacy, and using the technique to solve other issues that zoos face.

Acknowledgements

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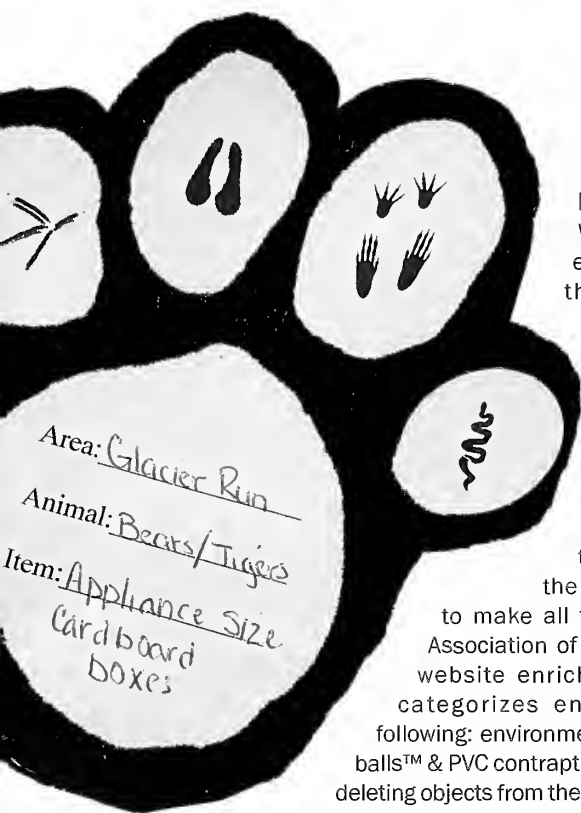


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Branching Enrichment: Connecting people and enrichment with an enrichment tree

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Introduction

With the goals of enrichment in mind, the Louisville AAZK

Chapter wanted to provide a way to make enrichment accessible to keepers in all the animal areas at the zoo. Because there are different types of enrichment,

the objective was to try

to make all forms available. The Association of Zoos and Aquariums website enrichment page (2014) categorizes enrichment into the following: environmental devices (boomer balls™ & PVC contraptions), habitat (adding/deleting objects from the environment), sensory

(anything that affects the senses), food (change presentation or type), social groupings, and behavioral

conditioning. The Louisville AAZK Chapter decided to focus on devices, habitat, food and sensory enrichments. The social and behavioral aspects are already a part of the daily husbandry routine and training demonstrations.

After some discussion, the Louisville AAZK Chapter decided to create an Enrichment Tree. The Enrichment Tree idea wasn't a new one. A previous group of AAZK members from the Louisville Zoo had originally developed the idea, but with time and staff changes, the Tree fell out of use. However, in 2012, a new set of members decided to reestablish the use of an Enrichment Tree to assist in providing enrichment items for the animal collection during the holiday season. The Tree concept is similar to that of the Angel Tree that is set up in shopping malls during the holiday season. Setting the tree up is straightforward, and most of the time commitment involves figuring out which items to request. Solicited

items on the tree range in cost from free donations up to hundreds of dollars; this way people of all ages and within all economic groups can participate. Creating zoo visitor involvement is the main goal of the Enrichment Tree. This program also allows the keeper staff, other zoo staff, and volunteers to contribute to animal enrichment. Finally, with tightening zoo finances, the Enrichment Tree enables the keepers to acquire items for their animals that otherwise may be difficult to obtain.

How to Build an Enrichment Tree

An Enrichment Tree begins with idea-gathering and concept design. The Louisville AAZK Chapter's version is as follows: First, a paw print is generated that reflects the area asking for an item, the specific animal the item(s) would benefit, and a description of the actual item(s). If an area has an enrichment idea in mind that involves constructing an enrichment device of some kind, a gift card for materials is requested. Often a gift card from selected local establishments is requested just for general enrichment shopping. This information is included on the front of the paw, and the back contains the Louisville AAZK logo and a "return by" date for the shopper. The paw prints are then made and distributed to all the animal areas with an instruction sheet explaining what information is needed on the paw, along with the suggestion to, when possible, include a website (i.e. www.boomerball.com) with the description, or a photo of the item, to facilitate accurate shopping. Completed paws are returned to the AAZK Chapter by a specified date. The paw prints are kept on whole sheets of paper to facilitate easier completion for the keeper staff. Once the paw prints are returned, AAZK members cut them out, punch a hole in the paw prints, and attach a string for hanging the prints on the Enrichment Tree.

AAZK members contact the zoo's Horticulture Department and, when an appropriate tree is removed, it is reserved for the Enrichment Tree. Trees that are used as Enrichment Trees will themselves become enrichment items once the event is completed. The Enrichment Tree is set up in a highly visible spot with public access. This spot is usually the zoo's main entrance because there is an overhang that helps protect the Tree, and it is easy for the public and staff to access. In the past, the Tree was set up in the reception area, but not many people travel through this area, making the tree difficult to find. Once the tree is set



Gifts before given to an animal area.



Grizzly Bear with two new gifts. Photo by Angie Cox



Amur Tiger with new gift. Photo by Angie Cox.



Decorated Enrichment Tree

up and the paw prints have been prepared for hanging, the decorating begins! The paw prints are the main ornaments, but a few traditional ornaments are placed on the tree for some color contrast.

The next step is getting the word out to the public about the Enrichment Tree. AAZK members create an informational poster that explains the tree and its purpose. This poster also gives a brief description of enrichment and how the donated items will be used. The poster is placed by the tree. AAZK members also engage the Public Relations Department. With their help, the Enrichment Tree is posted on the Zoo's Facebook page, and announced during a segment on a local news station. There is also a small write-up in the Zoo's quarterly publication. The Chapter also relies on "word of mouth" notification, letting people know the Tree is up and open for business during casual conversation.

Using the Enrichment Tree

When the visitors arrive at the Enrichment Tree, they take a paw print that is of interest to them, and then they go shopping! Once purchased, the items are returned to the Zoo's reception area and forwarded to the Louisville AAZK Chapter. The gifts are not immediately distributed to the appropriate area; a slight delay is needed so that a list can be compiled of all the gifts received. The list is later given to the Zoo's Development Office, which oversees donations. When the donor drops off a gift, he/she is asked to fill out a contact form so an AAZK member can send a thank-you letter. The Enrichment Tree is displayed throughout the month of December, and donations are accepted into January; any "late" arriving donations are still much appreciated and never turned away!

After the donation is recorded, AAZK members deliver it to the area of the zoo that cares for the animal designated on the paw print. The keepers then provide the animal with the enrichment gift when it is best for everyone. When possible, photographs are taken of the animals with their enrichment items. These pictures are archived for use in future Louisville AAZK Chapter events.

Conclusion

The Enrichment Tree has been very successful at the Louisville Zoo, but there are always ways to make it better. Improvements are already being made. For example, a few years ago several areas requested lawn bags for enrichment purposes. While lawn bags were received, unfortunately, they couldn't be used for enrichment because they were plastic! The bags did get used for trash, but not for the intended enrichment. So, the next year keepers specifically requested paper lawn bags to make sure to receive bags that the animals could safely enjoy. Another idea for improvement involves possibly putting up a summertime "Palm Enrichment Tree," which could provide additional enrichment items and reach a larger audience during this busy time of year... Another improvement currently under discussion is following up with gift givers. In the future, the Louisville AAZK Chapter would like to provide the gift givers with a photo of the animals interacting with the enrichment item that was provided. Also, there has been discussion of holding an enrichment party as a thank-you for the gift givers. There are also small enhancements that can always be made. One of the changes being considered is laminating the paw prints so they can be reused year after year. Currently, the paper paw prints are recycled after the event ends. In conclusion, no matter the overall contributions or what is to be adjusted or modified, the Enrichment Tree has proven to be a continued success for the animals, visitors, keeper staff and the Louisville AAZK Chapter.

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Boomer Ball. 6 June 2015. <<http://www.boomerball.com>>



How do you tell a gift? Photo by Corey Dutton



How do you tell a gift? Photo by Alexis Dutton, Wisconsin

Editor's Comments By Julie Hartell-DeNardo

Thanks to Amy and the Louisville AAZK Chapter for sharing your Ideas for successfully Implementing (and continually Improving) an Enrichment Tree to enhance available enrichment options! It sounds like you achieved your goal of providing a way to make enrichment accessible to keepers within all the animal areas at the zoo. Much like enrichment itself, if we don't continue to look for new Ideas, Improve old Ideas, and think outside the box, our enrichment programs, activities and events can become stagnant and ineffective. What is really great is that you identified an idea that had been done previously at your institution, revived it for even greater results than before, and are continually striving to further advance it by adding new Ideas. We appreciate that you shared some of the things you learned along the way to improve results; like (as the realtors say) location, location, location can play a role in visibility/accessibility, and that sometimes the little details, like what type of lawn bag, can make a big difference in understanding. Your Ideas to find more ways to acknowledge gift givers could go a long way in developing repeat givers, as everyone loves a little positive reinforcement, and animal photos are always rewarding! We would love to hear what other Chapters have tried with Enrichment Trees – post your ideas to the AAZK Facebook page today!

**Have a great enrichment
idea, study or story? Share
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Call for Papers

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Harry's Incredible Adventure International Rhino Foundation

By Bill Konstant

Harapan, ('Harry' to his keepers), the last of three Sumatran rhinos born at the Cincinnati Zoo and Botanical Garden, was sent to his native Indonesia late last year, the final pages in the North American chapter of an international managed breeding program for this critically endangered species. Harapan's voyage focuses the spotlight on international efforts to ensure the Sumatran rhino's survival, which will likely require every tool in the conservation tool chest.

Through Bowling for Rhinos and related fundraising activities, the American Association of Zoo Keepers contributes significantly each year to anti-poaching programs in Indonesia. Via the International Rhino Foundation, these funds support Rhino Protection Units (RPU) managed by Yayasan Badak Indonesia (YABI; the Rhino Foundation of Indonesia), a non-governmental organization that assists government patrols in three national parks. Two of the parks – Bukit Barisan Selatan and Way Kambas – are located in southern Sumatra and may harbor between one-half and two-thirds of the world's remaining Sumatran rhinos, currently estimated to number no more than 100 animals in the wild. RPUs are also active in Java's Ujung Kulon National Park, the world's last stronghold for the critically endangered Javan rhino, of which approximately 60 animals are believed to survive. In addition to

wild Sumatran rhinos, Way Kambas National Park is also home to the Sumatran Rhino Sanctuary (SRS), to which Harapan was sent.

Including the recent addition, the SRS holds six Sumatran rhinos:

- **Andalas**, a breeding male that was born at the Cincinnati Zoo and Botanical Garden on September 13, 2001 (the first of his kind born in captivity in more than a century) and sent to Way Kambas in 2007;
- **Ratu**, a rescued wild female (believed to be about 14-years-old) that was successfully bred by Andalas, gave birth to her first calf in 2012 and is once again pregnant, with her second calf expected in May of this year;
- **Andatu**, Ratu's three-year-old calf born June 23, 2012 and the first of his kind born in captivity in Indonesia;
- **Bina**, an older wild-caught female (believed to be about 26-years-old) from Bengkulu Province where the species was formerly abundant;
- **Rosa**, a female of unknown age that was rescued from the forests surrounding Way Kambas when she wandered into a nearby village;
- **Harapan**, the third calf born in Cincinnati on April 29, 2007 to parents Ipuh and Emi.



Loading Harapan onto the international flight



Rhino keeper Paul Reinhart accompanying Harapan en route to Indonesia



Harapan's crate being unloaded at the Sumatran Rhino Sanctuary
Way Kambas National Park, Indonesia

As the SRS lies within the boundaries of Way Kambas National Park, all of its resident rhinos benefit from regular patrols undertaken by the RPUs. RPUs also monitor and protect other species that share the surrounding forest habitat, such as elephants, tigers and tapirs, all of which are threatened by illegal hunting and trapping. As a result, the Sumatran rhino serves as a flagship species for wildlife conservation in Indonesia, and this program is an excellent example of *meta-population* management, in which captive and field-based programs are integrated in an overall survival strategy.

The successful breeding of Sumatran rhinos in captivity is thanks in large part to the pioneering research in reproductive physiology conducted by Dr. Terri Roth, the Cincinnati Zoo's Vice President of Conservation & Science, Director of its Center for Conservation and Research for Endangered Wildlife, and a member of the International Rhino Foundation's Board of Directors. The expertise of Terri's colleague, rhino keeper Paul Reinhart, has also contributed significantly to breeding efforts in the United States and Indonesia. His presence during transport and at times of impending Sumatran rhino births is considered mandatory.

Harapan's daily care is now the responsibility of a dedicated team of Indonesian rhino keepers and veterinary staff, who ensure the best available husbandry for these special animals. Each of the rhinos at the Sanctuary is maintained in a large natural forest enclosure, in which they can forage and wallow in safety thanks to the presence of the RPUs. In addition, the keepers inspect and bathe their charges daily, as well as provide them with fresh fruits and foliage that have been collected from the surrounding forests, and a variety of commercial produce that helps complete a balanced diet.

Back in the United States, the Greater Cincinnati AAZK Chapter also stepped up to the plate by hosting its inaugural Bowling for Rhinos event this past October and raising more than \$8,500. As with similar funds raised by zoo keepers across the country, a major portion helps support Sumatran and Javan rhino conservation efforts. Bowling for Rhinos dollars also contribute to anti-poaching programs that help protect African black rhinos and white rhinos in Kenya's Lewa Wildlife Conservancy, about which you can read in the April 2016 issue of *Animal Keepers' Forum*. 🐘

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Harapan just out of crate

IMPRINT INSPIRED: Red Kangaroo Training Program at Franklin Park Zoo

Maggie Sawyer – Senior Zoo Keeper
Zoo New England's Franklin Park Zoo, Boston, MA

In 2014, Zoo New England's (ZNE) Franklin Park Zoo (FPZ) in Boston, Massachusetts revived a behavioral conditioning program with our collection of red kangaroos (*Macropus rufus*). Our mob was comprised of five females, all born at FPZ and ranging in age from one to 10.5-years-old, and a five-year-old breeding male acquired from another zoo as a juvenile. Our oldest female, Imprint, had previously had regular human interaction. As her name implies, she was hand-raised by zoo keepers after her mother died with a nursing joey still in the pouch.

Past attempts at training met with minimal success because of inconsistent training times, stemming from seasonal accessibility and perceived decreases in food motivation. In warmer months the kangaroos are outside on exhibit during the day, limiting training opportunities. Training on exhibit was generally unsuccessful as the availability of grass on exhibit decreases their motivation to work for other food. Training in the morning prior to shifting out was minimally successful, as anticipation to go out caused the animals to be unfocused. During the winter the kangaroos remain in their barn, which proves to be the ideal time to focus on their training. We can access the animals for more sessions, the distraction of going outside is eliminated, and the animals show more interest in our food rewards. During winter, conditioning new behaviors is the focus, while during the warmer months maintaining trained behaviors and interest is the goal.

The current training program was established to help make general husbandry practices such as shifting, obtaining monthly weights and performing visual exams easier and more efficient. By increasing keeper/animal interactions with the introduction of positive reinforcement training, another goal was to lessen the kangaroos' natural nervous tendencies in the presence of staff. At the request of the staff veterinarians, the long-term goals of the program were to perform pouch checks on the females, as well as hand-inject the kangaroos for vaccinations, antibiotics and anesthetics for medical procedures when necessary.

First Steps and Relationship Building

The first step of our training program was to determine what food could be given as high-value reinforcement. Food preference observations were made using food from their diet, such as sweet potato and kale stalks; we also tried carrots, pears, banana, and cooked oatmeal. The winning food items were sweet potatoes and bananas. Once primary reinforcement was determined, we "charged" the clicker to build the conditioned reinforcer.

Prior to the program, the animals generally displayed reactive or nervous behavior toward keepers. Through training, relationship building began with the kangaroos, as well as desensitizing them to the trainer's presence. Generally, animal training at ZNE is protected contact, but with approval and safety protocols in place we worked with the kangaroos in a free-contact setting. Sessions were conducted with all stalls open and the animals having the option to participate or not. A kangaroo was bridged and rewarded when they approached within two to three feet of



Mobile T-perch station with mat and T-perch board station
Photo credit: Margaret Sawyer

the trainer. The length of the sessions was usually kept to a maximum of 15 minutes, depending on the interest level of the animals. Initially, having Imprint in the stall was a benefit as it seemed to help give the others more confidence to approach, but she began to monopolize the sessions. At the end of December 2014, Imprint was separated into an adjacent stall for her training sessions, where she would remain while the other kangaroos were trained.

As training progressed and the kangaroos were more comfortable with the trainer's presence, a target pole was then introduced and desensitized. The kangaroos were then transitioned to stationing onto a T-perch platform, which was a long wooden board with a T-shaped perch on one end. Some of the kangaroos were nervous around the large platform, so a smaller, rubber black mat with a scaled-down "mobile" T-perch was substituted which proved more successful. Once the kangaroos would consistently station, the next step was to achieve proper positioning (description below).

IMPRINT

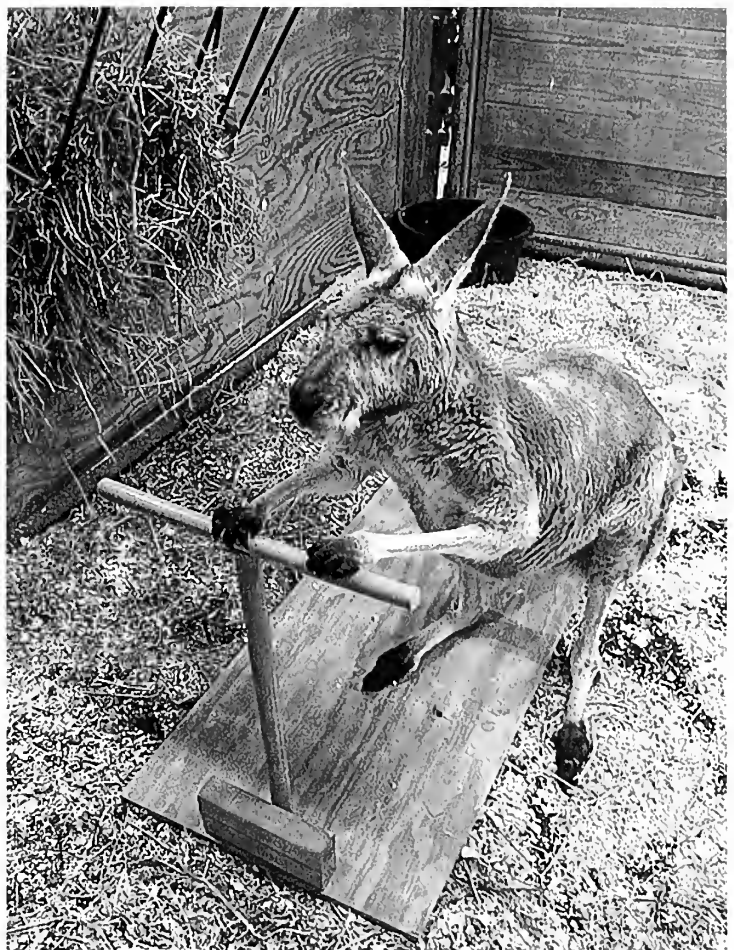
Imprint was always an eager and fun animal to train, rarely startled or concerned about new objects or situations. She quickly learned "target" and to station on the wooden board. The target pole was used to orient her into the correct position on the station. Imprint progressed rapidly during her individual training sessions, and always remained many steps ahead of the other kangaroos.

In April of 2014, keepers noticed blood on Imprint's arms and pouch, along with an excessive amount of pouch cleaning and licking. This observation prompted the first pouch check attempt; though it had not yet been trained, Imprint allowed both the trainer and the veterinarian to look and feel inside her pouch. This did not provide a diagnosis, but did give enough information to determine that an exam under anesthesia would be necessary. Imprint underwent a surgical procedure to remove a mass inside her pouch, which was diagnosed as *mammary gland adenocarcinoma*. Consequently, training for formal pouch checks became a priority for monitoring recovery and long-term health.

Post-surgery, Imprint tolerated pouch checks while being fed by the trainer. As the complete behavior had not yet been established, Imprint would allow checks until she finished her food, then would leave the session. During this recovery period, when Imprint was distracted vets were able to hand-inject antibiotics to counter infections that had developed. Unfortunately, as Imprint's medical treatments and injections continued, she became increasingly nervous, especially when more than one person entered her stall. Food rewards were offered after an injection, but she generally was too distressed to show interest. The training and relationship that had been built began to break down.

Retraining

After a long recovery and battle with infection, Imprint's training program was restarted. The first goal was to teach Imprint the proper positioning on the T-perch station. Once on the platform, with Imprint facing the trainer, we shaped the "hands up" behavior by getting her to place both front paws on the top of the T-perch. This was done by targeting her head above the T-perch bar, which naturally extended her neck upward with her arms forward and out. With this natural extension and Imprint's calm demeanor, the trainer physically positioned ("moulded") Imprint's front paws onto the bar. When her paws touched the bar, she was bridged and rewarded. Duration holding this position was increased gradually by offering continuous reinforcement. It was only a few short sessions before Imprint voluntarily put her own front paws on the bar. This behavior was quickly established to where Imprint would position properly when cued and remain in that position until released.



Established "hands up" with Imprint. Photo Credit: Kim Kezer



Shaping position of male with mobile T-perch. Photo Credit: Kim Kezer

Pouch Checks

After Imprint mastered holding in position, the command “touch pouch” was used to touch the outside of Imprint’s pouch. Once she was comfortable with this, the same command was used to then open and touch inside her pouch. Imprint quickly became comfortable doing this behavior for one person. However, it was critical for her to allow an additional person be present and ultimately hospital staff to do the check. Imprint went through an extensive period of time where she was desensitized to having a second person be present. We started with familiar keepers, graduated to volunteers, eventually ending successfully with a veterinarian able to extensively examine her pouch while Imprint calmly held her station position.

Imprint’s training proved very beneficial as it was easier to monitor her pouch for additional tumor growth or infections, as well as minimize immobilizations. Additionally, her pouch could be cleaned using gauze pads soaked in dilute chlorhexidine solution, and samples of discharge from inside her pouch were also taken for cytology and cultures. Imprint’s training program facilitated additional treatments not previously attempted, such as applying cream to fly bites on her ears, checking wounds on her feet, and hand-feeding medications.

Unfortunately, in mid-February 2015, Imprint’s health rapidly declined. After almost a year of battling her illness and accomplishing many training milestones along the way, Imprint was humanely euthanized for quality of life reasons. However, Imprint was well trained and very responsive to her trainer as her program progressed, and her quality of life had improved tremendously.

Training the Group

While we had focused on Imprint for medical reasons, we still had the mob to train. Due to staffing, we have many more animals than trainers, which made it difficult to progress with individual animals. When training the mob together, priority and attention is given to the kangaroo that approaches the station first. Once properly stationed, they are rewarded for remaining at a station while another animal is trained. Our goal is to have multiple stations for animals to remain at simultaneously, until released.

Achieving consistent responses and interest from the kangaroos has been one of the most challenging aspects of this training program. Interest and participation varies between individuals, and kangaroos exhibit short attention spans. To address this issue, the duration of a session is no more than fifteen minutes. Defining the beginning and end to the session and establishing a distinct window of opportunity to earn reinforcement has reduced intermittent participation. Sessions end on a positive note, ideally when the kangaroos are still interested.

Although their list of training behaviors may not be long, from a husbandry point of view there have been many successes. The mob’s behavior toward keepers is more relaxed and the animals are more tolerant of changes in their environment. The animals are more comfortable with participating in obtaining weights, demonstrating less anxiety towards the scale. Currently, we have four out of five kangaroos consistently participating in training sessions, which include stationing and targeting behaviors. The kangaroos are all at different training levels so adjustments have to be continually made for the program.

Future goals for the program still include pouch checks for the females and hand-injections. The more achievable short-term goals are for the kangaroos to learn the “hands up” behavior and the “touch” command, both on the outside of the pouch and the side of their back legs. Additionally, the program aims to find successful methods of working with the kangaroos on exhibit, so that the summer months can be much more productive. Maintaining current behaviors will also maintain a



Cleaning Imprint’s pouch. Photo Credit: Kim Kezer



Shaping targeting with multiple kangaroos. Photo Credit: Kim Kezer



Shaping "hands-up" behavior with Imprint. Photo Credit Kim Kezer

higher standard of husbandry, which includes getting regular weights.

As the primary trainer for this program, I would have not known what was possible to achieve with the kangaroo collection without the training experience I had with Imprint. I would have been easily discouraged because of the lack of compliance from the mob, but Imprint has given me encouragement, motivation and a path to follow.

Acknowledgements

I would like to thank all the staff at Franklin Park Zoo that assisted, supported, and encouraged our work with the red kangaroo training program. In particular, I would like to thank the veterinary staff for the stellar level of care they provided to Imprint, and the cooperation and support they gave me with Imprint's training. Finally, a big thank you to Kim Kezer for all her training advice and assistance, as well as all the time and work she spent helping me edit and revise this paper. Thank you! 🐨

BHC comments by Jay Pratte

This Tale is a good, solid example of how to overcome several different obstacles, and still meet realistic training goals. Imprint had to overcome several challenges, but was able to reach a point where routine medical examinations were no longer stressful or a problem. The medical complications that Imprint endured are also not uncommon, and we have all seen similar types of issues with species in our care. One of the things I recommend to all trainers when they are setting goals is to think ahead. Know your species, and be cognizant of medical issues common to those animals, particularly in captive situations. Trainers can set goals, and then shape steps accordingly. Even in animals that have a large repertoire of behaviors, when a keeper asks me, "What should I train next?" I always answer, "Everything." Train them to present every body part, and allow touch. To have ears, eyes, wings, feet, everything inspected. Teach them to accept sterile eye drops in case they ever develop an infection; to tolerate clippers, ultrasound probes, and other things to help with an injury or site treatment; and above all ALWAYS INCLUDE YOUR VET STAFF. Like the author did for Imprint, set one of your goals as desensitizing your animals to a second, unfamiliar person, and ultimately your vets/techs.

The other part I want to highlight was addressed early on, where the author mentioned that the other animals' confidence grew while watching Imprint. The importance of social learning and mimicry in animals should never be underestimated. If you have one animal that trains well, let other animals observe sessions where possible. They will learn to associate the trainer with rewards, and cue off of the trainee's behavior, learning over time that training isn't the end of the world. Thank you for your Tale!

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Please submit your "Training Tales" and experiences in operant conditioning to share with *Animal Keepers' Forum* readers. This opportunity provides a convenient outlet for you to exhibit your training challenges, methods and milestones with the AAZK member network. Please submit entries based on the following guidelines:

1) Submit a brief description of a training project at your facility. These can be 500 words or less, in text or bullet points – it can be longer (up to 1000 words); however, short and simple descriptions with a few images are just as perfect. Details should include the following:

- ▶ Define the training goal (what did you try to do and for what purpose?)
- ▶ List important steps (How did you do it – include plans that changed along the way/what worked and what didn't work)
- ▶ Timeline used (how long did it take)
- ▶ Tips you learned along the way

2) Include 3-5 digital photos that clearly depict the animal in the learning process or performing the desired goal (provide photo caption and photographer of each image). Photos need to be 300 dpi and at least 1200 x 1800 pixels.

Please send submissions or questions to:

Kim Kezer at kkezer@zoonewengland.com or

Shane Good at shane.good@aazk.org

(Use *Training Tales Submission* as the subject).



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